Name_____

DATA Nugget

Invasive reeds in the salt marsh

Featured scientists: Lori LaFrance from Ipswich High School, Massachusetts and Liz Duff from Mass Audubon

Research Background:

Culverts run under roads and allow water from the ocean to enter a marsh. *Phragmites* can be seen growing in the background.

Phragmites australis is an invasive **reed**, a type of grass that grows in water. *Phragmites* is taking over saltwater **marshes** in New England, or wetland habitats near the Atlantic Ocean coast. *Phragmites* does so well it crowds out native plants that once served as food and homes for marsh animals. Once *Phragmites* has invaded, it is sometimes the only plant species left! *Phragmites* does best where humans have disturbed a marsh, and scientists were curious why that might be. They thought that perhaps when a marsh is disturbed, the **salinity**, or amount of salt in the water, changes. *Phragmites* might be able to survive after disturbances that cause the amount of salt in the water to drop, but becomes stressed when salinity is high.

Fresh water in a marsh flows from the upstream source to downstream. Saltwater marshes end at the ocean, where freshwater mixes with salty ocean water. One type of disturbance is when a road is cut through a marsh. Upstream of the road, the marsh is cut off from the salt waters from the ocean, so only fresh water will enter and salinity will drop. Downstream of the road, the marsh is still connected to the ocean and salinity should be unaffected by the disturbance. Often, a **culvert** (a pipe that runs under the road) is placed to allow salt water to pass from the ocean into the marsh. The amount of ocean water flowing into the marsh is dependent on the diameter of the culvert.

Students at Ipswich High School worked with scientists from the Mass Audubon, a conservation organization, to look at the *Phragmites* in the marsh. They looked at an area where the salinity in the marsh changed after a road was built. They wanted to know if this change would affect the amount of *Phragmites* in that marsh. In 1996, permanent posts were placed 25 meters apart in the marsh. That way, scientists could collect data from the same points each year. At these posts, students used **transects,** a straight line measured from a point to mark where data is collected. Then they collected

Name_____

data on all the plants that were found every meter along the transects. Data has been collected at these same points since 1996. In 2005, an old 30cm diameter culvert was replaced with two 122cm culverts. These wider culverts allow much more salty ocean water to flow under the road and into the marsh. Students predicted that after the culverts were widened, more ocean water would enter the marsh. This would make salinity go up, making it harder for *Phragmites* to grow, and it would decline in numbers. Students continued to survey the plants found along transects at each permanent post and documented their findings.

Students collecting data on the plant species present in the marsh using transects. Every 1m along the tape, students observe which plants are present. *Phragmites* is the tall grass that can be seen growing behind the students.

Scientific Question: How did replacing the narrow culverts with wider culverts change the growth of *Phragmites* in the marsh?

What is the hypothesis? Find the hypothesis in the Research Background and underline it. A hypothesis is a proposed explanation for an observation, which can then be tested with experimentation or other types of studies.

Scientific Data:

Use the data below to answer the scientific question:

Location	Average percent of *Phragmites* in each transect before the culvert was widened (1996-2005)	Average percent of *Phragmites* in each transect after the culvert was widened (2005-2014)
Transect 1(marsh side of culvert – upstream)	27%	17%
Transect 2 (marsh side of culvert – upstream)	60%	56%
Transect 3 (marsh side of culvert – upstream)	40%	0%
Transect 0 (ocean side of culvert – downstream)	52%	52%

Name_____

Average percent of upstream transects (3) before restoration _____

Average percent of upstream transects (3) after restoration _____

Percent of downstream transect before restoration _____

Percent of downstream transect after restoration _____

What data will you graph to answer the question?

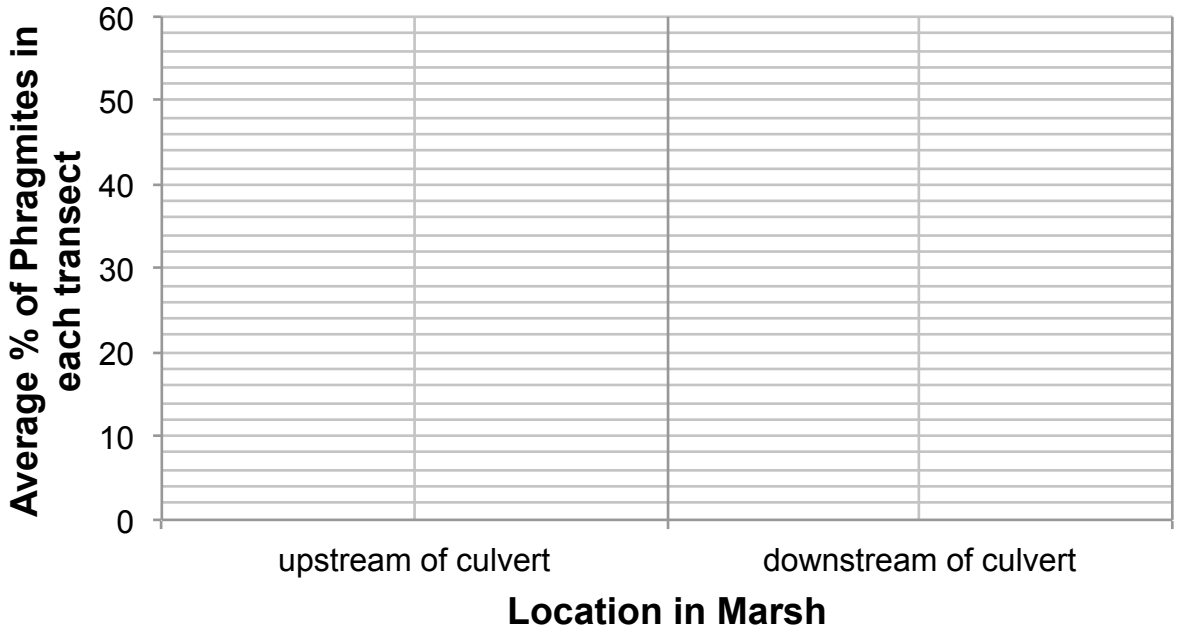
Independent variables: _____

_____

Dependent variable: _____

_____

Graph the data below:



Name_____

Interpret the data: Make a claim based on the evidence that helps answer the original research question. Connect the pattern in the data to a pattern in the natural world. Justify your reasoning using data.

Your next steps as a scientist: Science is an ongoing process. What new question do you think should be investigated? What future data should be collected to answer your question?